

IN THE CLAIMS

Please cancel Claims 1 - 14 (erroneously numbered 1-15 without No. 12) and add Claims 16 - 35 as follows:

16. A method of forming a CMOS image sensor, the method comprising:
forming a substrate with a first conductive type of a semiconductor material; and
forming a layer on top of the substrate, the layer being a second conductive type so as to form a junction that prevents substrate noise diffused into photo elements formed above the layer when a first voltage is applied to the substrate and a second voltage is applied to the layer, wherein the junction is reversely biased, and
wherein the CMOS image sensor is integrated with accessory CMOS circuits to facilitate the CMOS image sensor to operate as desired.
17. The method as in claim 16, wherein the junction is so formed to be a substrate noise barrier in the CMOS image sensor.
18. The method as in claim 16, further comprising:
forming a deep well of the second conductive type in the layer to prevent latch-up between the accessory CMOS circuits and the substrate.
19. The method as in claim 16, further comprising:
forming a photodiode element, the photodiode element having a first well region of the first conductive type formed in the layer of the second conductive type; and
causing a second well region of the second conductive type to be formed in the layer of the second conductive type with higher doping density than that of the layer of the second conductive type.

20. The method as in claim 19, wherein the second well surrounds the first well region to form a lateral PN junction.
21. The method as in claim 20, wherein the first well region and the layer of the second conductive type forms a vertical PN junction.
22. The method as in claim 21, wherein both the lateral PN junction and vertical junction are reversely biased.
23. The method as in claim 16, wherein a distance between a micro-lens and a photo element in the CMOS image sensor is reduced by adding an extra process of chemical mechanical polishing (CMP) to eliminate a conventional planarization layer such that sensitivity of the photo element is increased.
24. The method as in claim 16, further comprising:
forming a deep well of the second conductive type in the layer to prevent latch-up between the accessory CMOS circuits and the substrate, and
wherein the deep well is formed at a center depth in a range of 0.5um to 2um for a thickness in a range of 0.5 um to 2um with the second conductive type doping outside the photo element to prevent the latch-up to happen.
25. The method as in claim 16, further comprising:
growing a top oxide layer on top of the layer; and
carrying out a process of chemical mechanical polishing (CMP).
26. The method as in claim 16,
wherein the substrate is of N type, and the layer is of P type, and
wherein the first voltage is higher than the second voltage.
27. The method as in claim 16,
wherein the substrate is of P type, and the layer is of N type; and

wherein the first voltage is lower than the second voltage

28. A CMOS image sensor comprising:
 - a substrate of a first type of a semiconductor material;
 - a layer being a second type of a semiconductor material disposed on top of the substrate to form a junction that prevents substrate noise diffused to photo elements formed above the layer when a first voltage is applied to the substrate and a second voltage is applied to the layer, wherein the junction is reversely biased, and
 - wherein the CMOS image sensor is integrated with accessory CMOS circuits to facilitate the CMOS image sensor to operate.
29. The CMOS image sensor of claim 28, wherein the junction is so formed to be a substrate noise barrier that prevents substrate noise diffused into other photo elements in the CMOS image sensor.
30. The CMOS image sensor of claim 29, wherein a deep well of the second conductive type is formed in the layer to prevent latch-up between the accessory CMOS circuits and the substrate.
31. The CMOS image sensor of claim 28 the substrate is of N type, and the layer is of P type, and wherein the first voltage is higher than the second voltage.
32. The CMOS image sensor of claim 31, wherein a deep well of P type is formed in the layer to prevent latch-up between wells to form a photo element and the substrate.
33. The CMOS image sensor of claim 28, wherein the substrate is of P type, and the layer is of N type, and wherein the first voltage is lower than the second voltage.

34. The CMOS image sensor of claim 33, wherein a deep well of N type is formed in the layer to prevent latch-up between wells to form a photo element and the substrate.
35. The CMOS image sensor of claim 28, wherein a distance between a micro-lens and one of the photo diodes is reduced by adding an extra process of chemical mechanical polishing (CMP) to eliminate a conventional planarization layer such as a sensitivity of the one of the photo diodes is increased.